Final Report for NASA AISR Program

Title: "WITS: The Web Infrared Toolshed"

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WITS: The Web Infrared Tool Shed

This project is to provide World Wide Web based tools for the analysis of infrared and submillimeter, line and continuum observations. The Web Infrared Tool Shed (WITS) contains two "toolboxes": the PhotoDissociation Region Toolbox (PDRT) and the Dust InfraRed Toolbox (DIRT). These toolboxes provide an extensive database of PDR and dust continuum models that can be "mined", displayed, and manipulated using a Java user interface. Direct links to WITS appears on the IPAC home page, one of the main Web portals for infrared observers, and on the Spitzer contributed software page. We average approximately 2000 hits/month on our server at UMD. We continue to receive e-mails from users of both PDRT and DIRT about how best to analyze their data, and for suggestions and requests for future developments. We have also been notified that our tools are used as on-line laboratory exercises (e.g., University of Arizona, University of Illinois).

Over the past year we have been running models over a larger parameter space which cover the low luminosity and low effective temperatures necessary to model brown dwarf emission. Also, in anticipation of the need to convolve models with instrument-specific profiles we have improved the code to output a finer frequency and spatial grid. The new models include spectral energy distributions convolved with Spitzer IRAC and MIPS filters. We implemented the required java modules to represent a diverse set of instruments on Spitzer. Using these instrument modules, users of DIRT can extract our theoretical models with the spectral responses of the instruments. This allows both prediction of source fluxes for observation preparation and post-observation model fitting of data.

We have finished restructuring the DIRT code to improve flexibility, performance, and to take advantage of the newer Java classes provided by Sun Microsystems. Previously, the plotter interaction and Java representation in memory of the model data were somewhat tuned to DIRT-type data. After the restructuring, the user interface management classes have been decoupled from both specific data format and memory representation. (This type of design is known as the Model-View-Control paradigm and is considered current best practice for applications like DIRT). This allows greater flexibility in adding new types of models, and viewing the model data in different ways. Furthermore, by replacing some of our "home-grown" Java classes with new Java 2 MVC classes from Sun, performance on operations like data selection and filtering have been improved.

We have redesigned the front page of the WITS web site. The new front page better reflects the mission of WITS and includes highly-visible, graphical links to NASA missions that WITS is intended to support. WITS has been repeatedly referred to by others in VO-related presentations as the best example of how to incorporate theoretical data into a virtual observatory. We couldn't agree more!

Over the past year we have had a number of requests for new models on both the DIRT and PDRT side. For PDRT we have added contours for CII/CI, CI/CO, and CII/CO line ratios. For DIRT we have requests from the Spitzer LEGACY team PI, Neal Evans, to add Ossenkopf and Henning grains with and without an external radiation field. We have carried out this model set. We have also begun adding models for the PDR cooling lines [Si II] 35μm, [Fe II] $26\ \mu$m, high-J CO lines, and H_2 rotational transitions. Having these available in PDRT are especially important for analysis of Spitzer data and future SOFIA observations.

We anticipate submitting a future AISRP proposal to continue to improve and expand the WEB Infrared Tool Shed.

PUBLICATIONS and ABSTRACTS

References

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[3] Pound, M. W., Wolfire, M. G., & Amarnath, N. S. 2003, "SIRTF Tools for DIRT", American Astronomical Society Meeting Abstracts, 203,

[4] Amarnath, N. S., Pound, M. W., & Wolfire, M. G. 2003, "Refactoring DIRT", ASP Conf. Ser. 295: Astronomical Data Analysis Software and Systems XII, 295, 381